



Animal welfare management in organic and low-input outdoor production systems: laying hens

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**Autumn School PPILOW – Assisi  
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**Behaviour and welfare of laying hens can be affected by conditions during different life phases:**

1. Maternal conditions during egg laying
2. Conditions during incubation and hatching
3. Early-life conditions (0-17 wk of age)
4. Adult-life conditions (17-80 wk of age)

Effects on: fearfulness, stress sensitivity, feather pecking, cannibalism

## PPILOW Maternal conditions





Measured feather damage and stress in parent stock and linked that to offspring performance

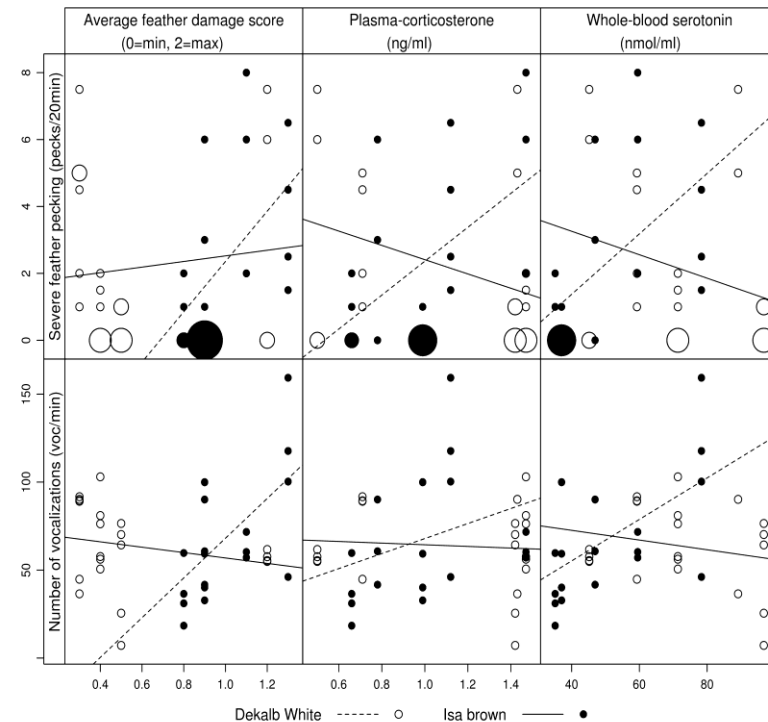
## White parent stock

with:

- High feather damage
- High basal CORT

Offspring with:

- High severe feather pecking wk 1!



(De Haas et al., 2014) 4

# PPILOW Conditions during incubation and hatching

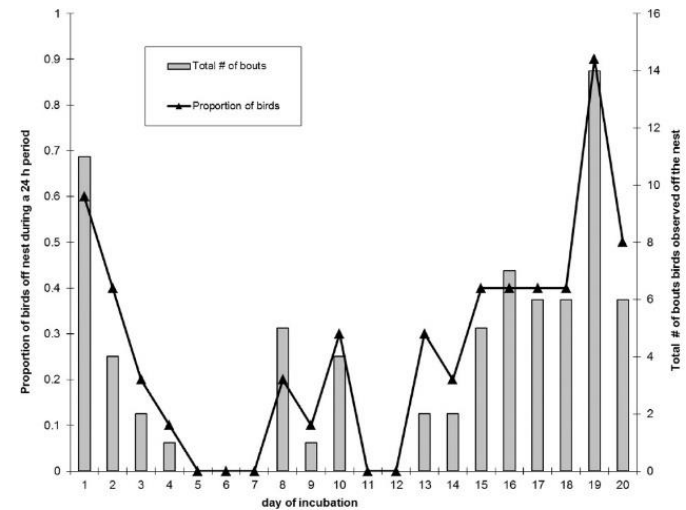
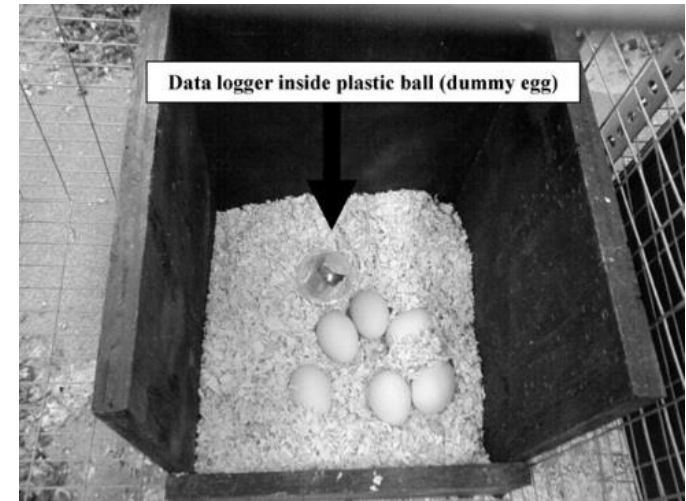
Eggs are normally incubated in darkness

Hen also leaves the nest from time to time

Recent studies show positive effects of light during incubation in broilers (12L:12D)

Mechanisms:

- Increased brain lateralisation
- Earlier onset hormonal rhythms



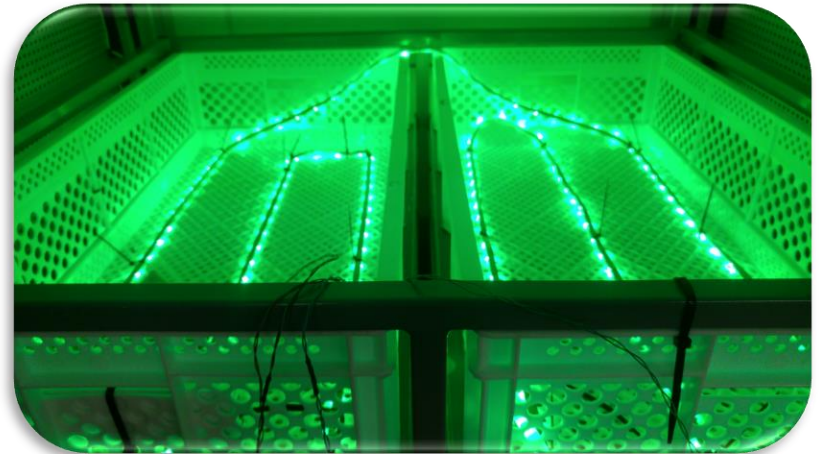
(Archer en Mench, 2014)

Light colour also plays a role

Short exposure to white light:  
more gentle feather pecking in  
young chicks (Riedstra and Groothuis,  
2001)

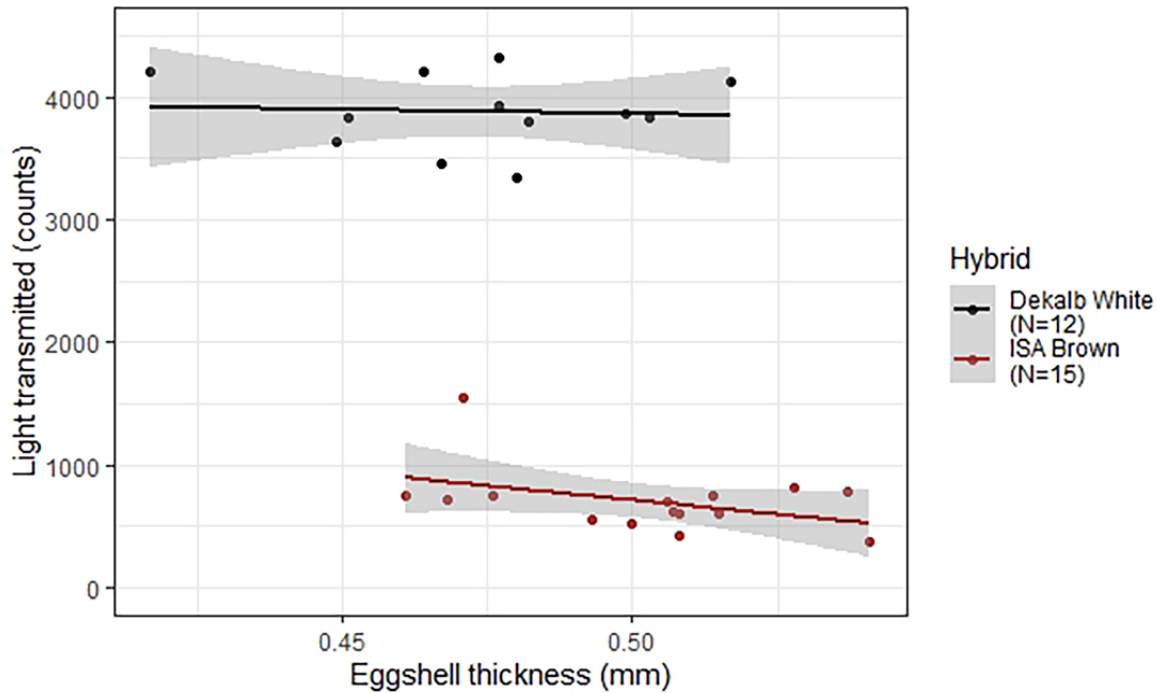
Research with 12L:12D with  
white, green and no light

- White: more FP than dark
- Green: less FP than dark  
(Ozkan et al., 2022)





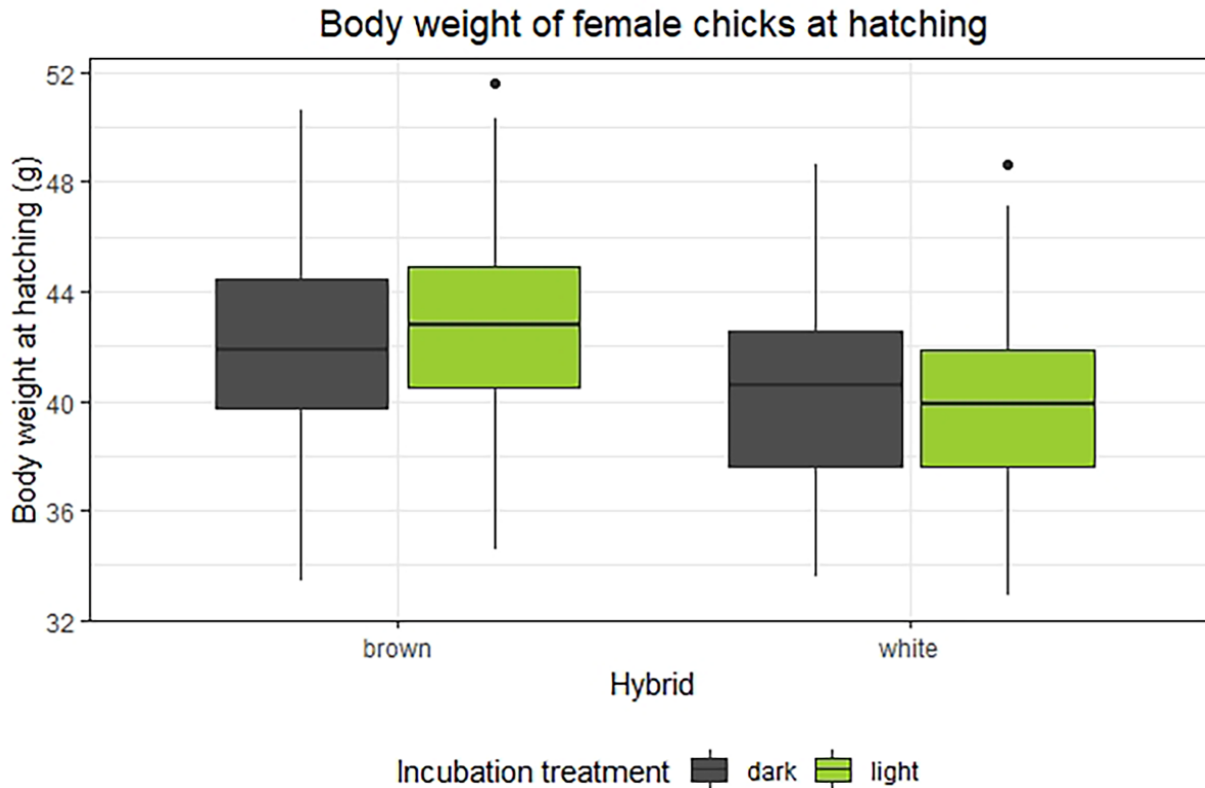
Correlation graphs between light transmitted at control peak and eggshell thickness (per hybrid)



White eggshell transmits much more light than brown

No relation with egg shell thickness

(Manet et al., 2023)



Differences between brown and white:

White hatched later, better navel score

Brown heavier and less embryo mortality during late incubation

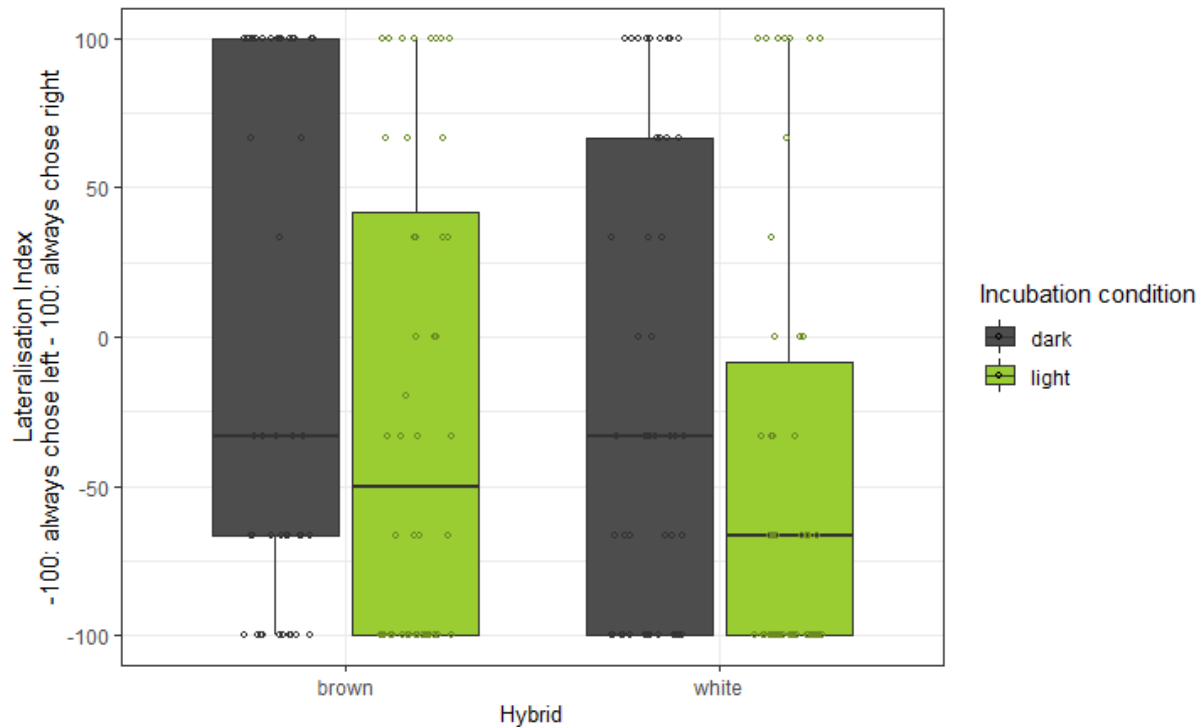
(Manet et al., 2023)



# PPILOW Light incubated chicks more lateralised



Lateralisation Index in a detour test



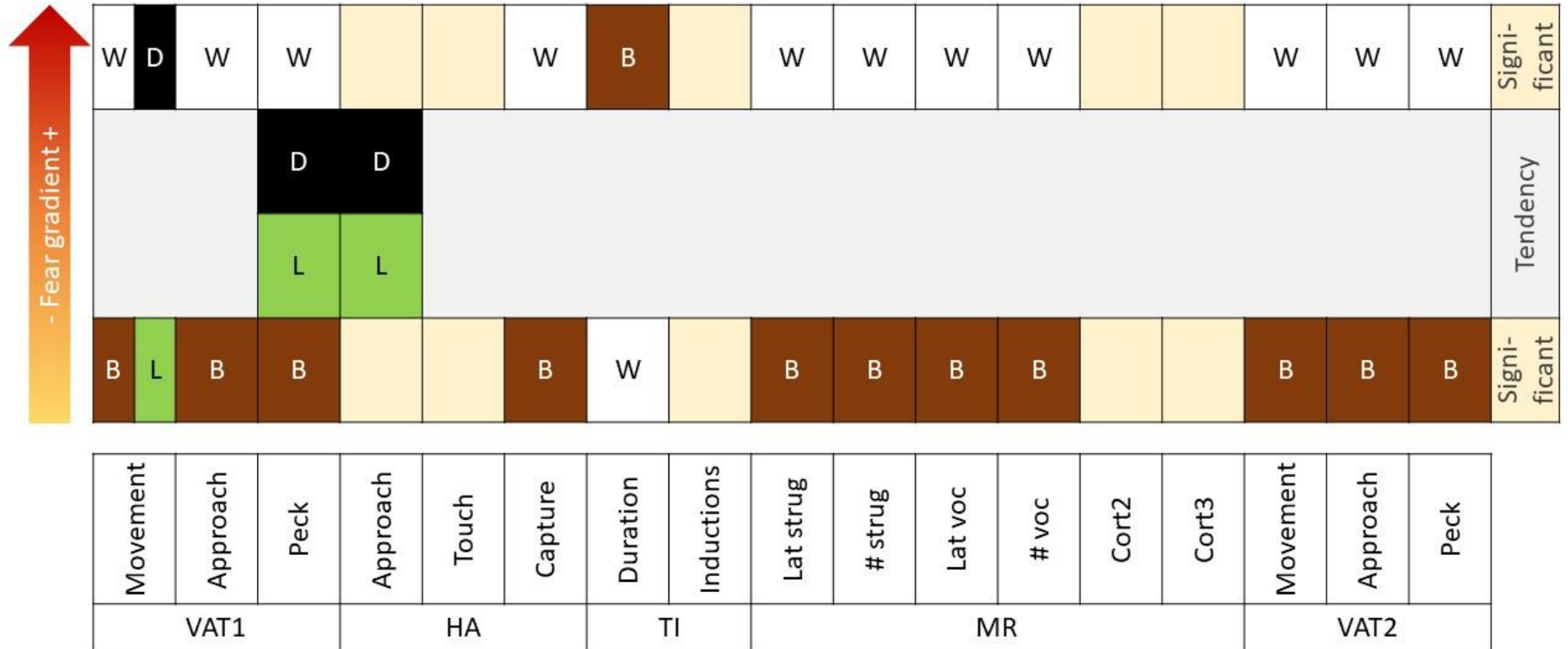
Light chicks tend to pass obstacle on the left

No difference brown and white

No effect on cognitive performance in holeboard test

(Manet et al., submitted)

# PPILOW White pullets more fearful than brown pullets



(Manet et al., 2023)

# PPILOW PPILOW experiment: light during incubation and enrichment with insect larvae during early life



2x2 factorial design, 44 pens (400 birds) in total:

Light-Dark – No larvae	Light-Dark – Larvae	Dark - Larvae	Dark – No larvae
			

# PPILOW Behaviour tests overview

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<b>Round 1</b> Jan-Jun '20	NO-1		LT		FP	COVID				NOT-2 HA	TI			VR	FS			
<b>Round 2</b> Apr-Sep '21	NO-1 FBO		LT FBO		FP	VA	FBO	OF		NOT-2 HA	TI		VR		MS FS			CFL

## Individual tests:

LT = Lateralisation test

VA = Voluntary approach test

TI = Tonic immobility test

OF = Open field test

MS = Manual restraint test

FS = Feather scoring

CFL = Contrafreeloading test (pilot)

## Pen level tests:

NO = Novel object test

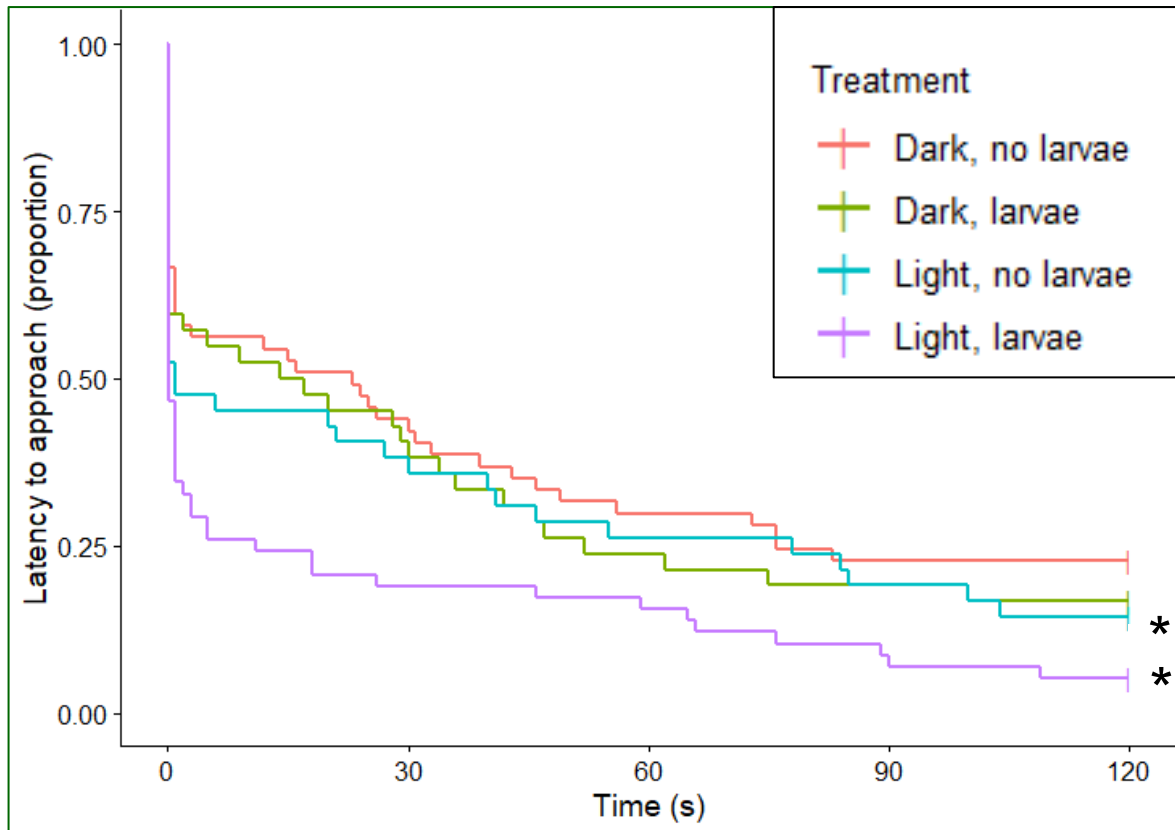
FBO = Foraging behaviour observations

FP = Feather pecking observations

HA = Human Approach test

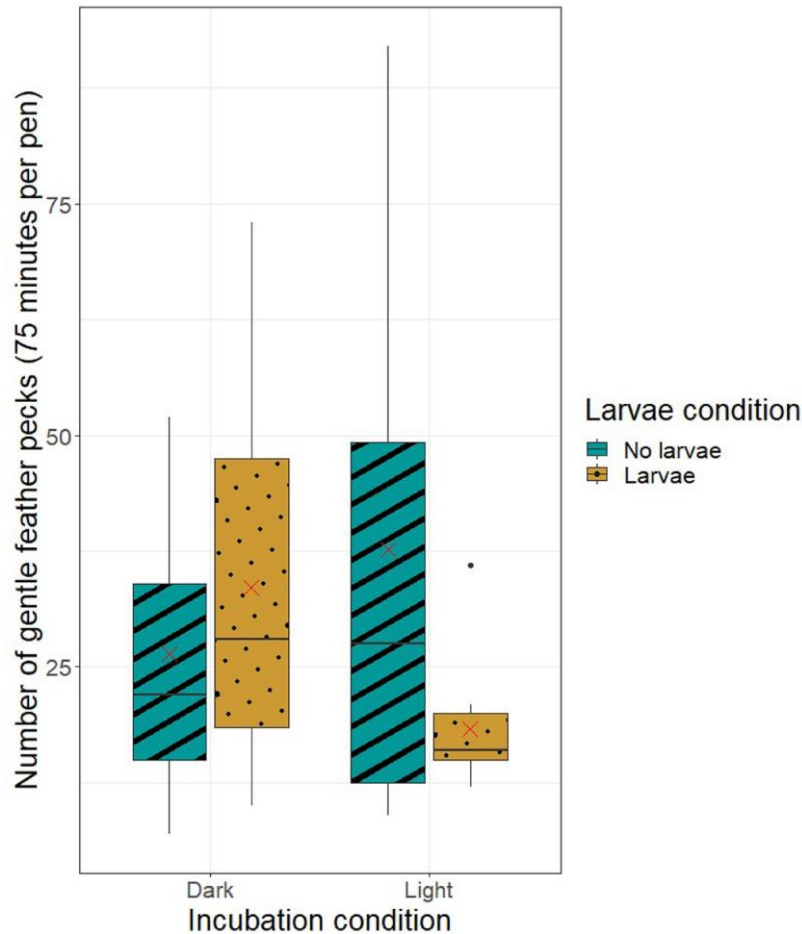
VR = Vaccination recovery test

## PPILOW Fear of humans (6 wks)



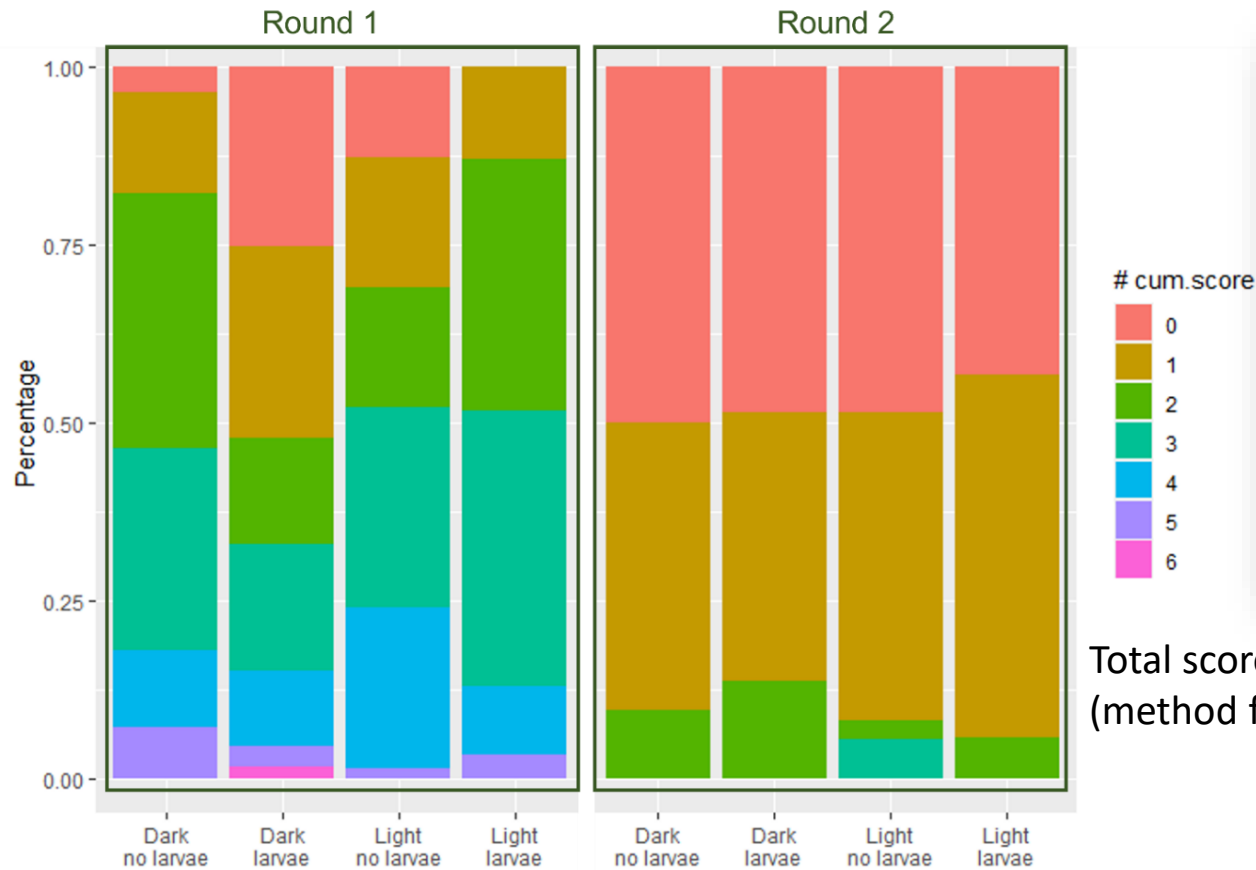
- Light-incubated birds approached 1.29 times faster than dark (95% CI 0.09-0.99,  $p < 0.05$ )
- However: No effects found in other fear tests

# PPILOW Feather pecking (5 wks)



- No effect of light-incubation and larvae on number of gentle FP
- Hardly any severe FP observed
- Gentle FP 1.34 times more often in round 1 compared to round 2 (95% CI 0.27-0.44,  $P < 0.0001$ )

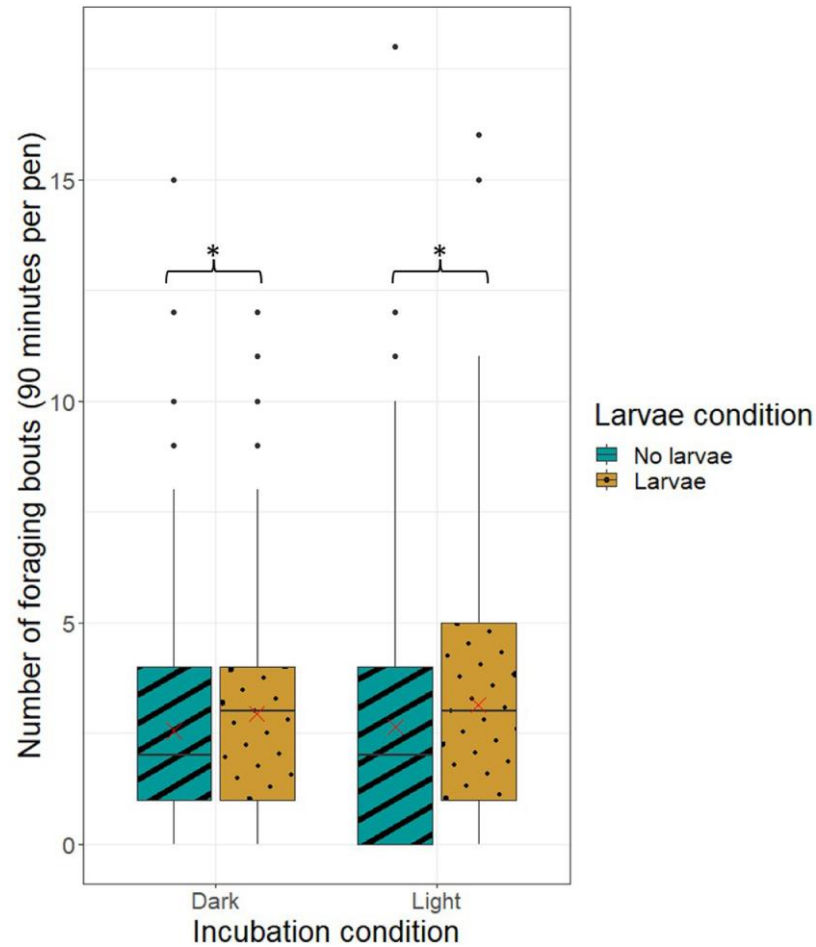
# PPILOW Highlights per task - Feather scoring (15 wks)



Total score of 11 body regions, 0 = no damage (method from Bilcik & Keeling, 1999)

- Overall little feather damage (max score = 54, our birds had max 6)
- No effects of light or larvae on feather damage
- Slightly more feather damage in round 1

# PPILOW Foraging behaviour (1, 3 and 7 wks)



- Larvae-enriched birds foraged 1.19 times more often than birds that did not receive larvae (no effect on total foraging time) (95% CI 1.02-1.29,  $p=0.008$ )



Effects of light during incubation seem stronger in broilers than in laying hens

Positive effects on brain lateralisation and on fear of humans, but no effect on other fear tests

Comparison white and brown strains shows how different these are in fearfulness: useful for practice

Environmental enrichment with insect larvae stimulates foraging in pullets – could help to reduce risk feather pecking



Measured feather damage and stress in parent stock and linked that to offspring performance

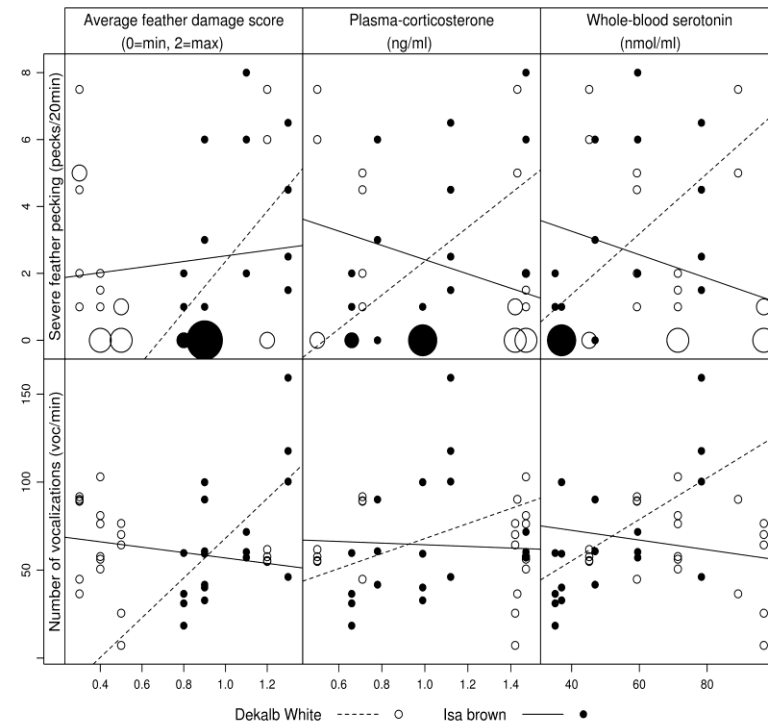
## White parent stock

with:

- High feather damage
- High basal CORT

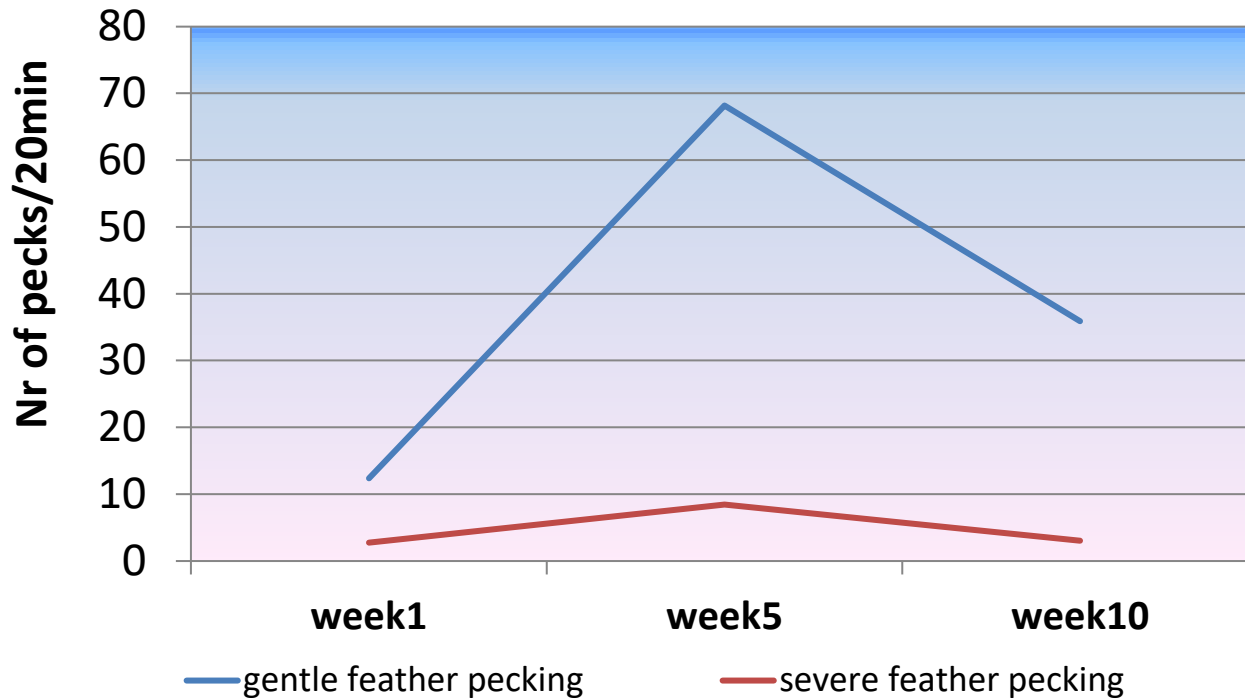
Offspring with:

- High severe feather pecking wk 1!



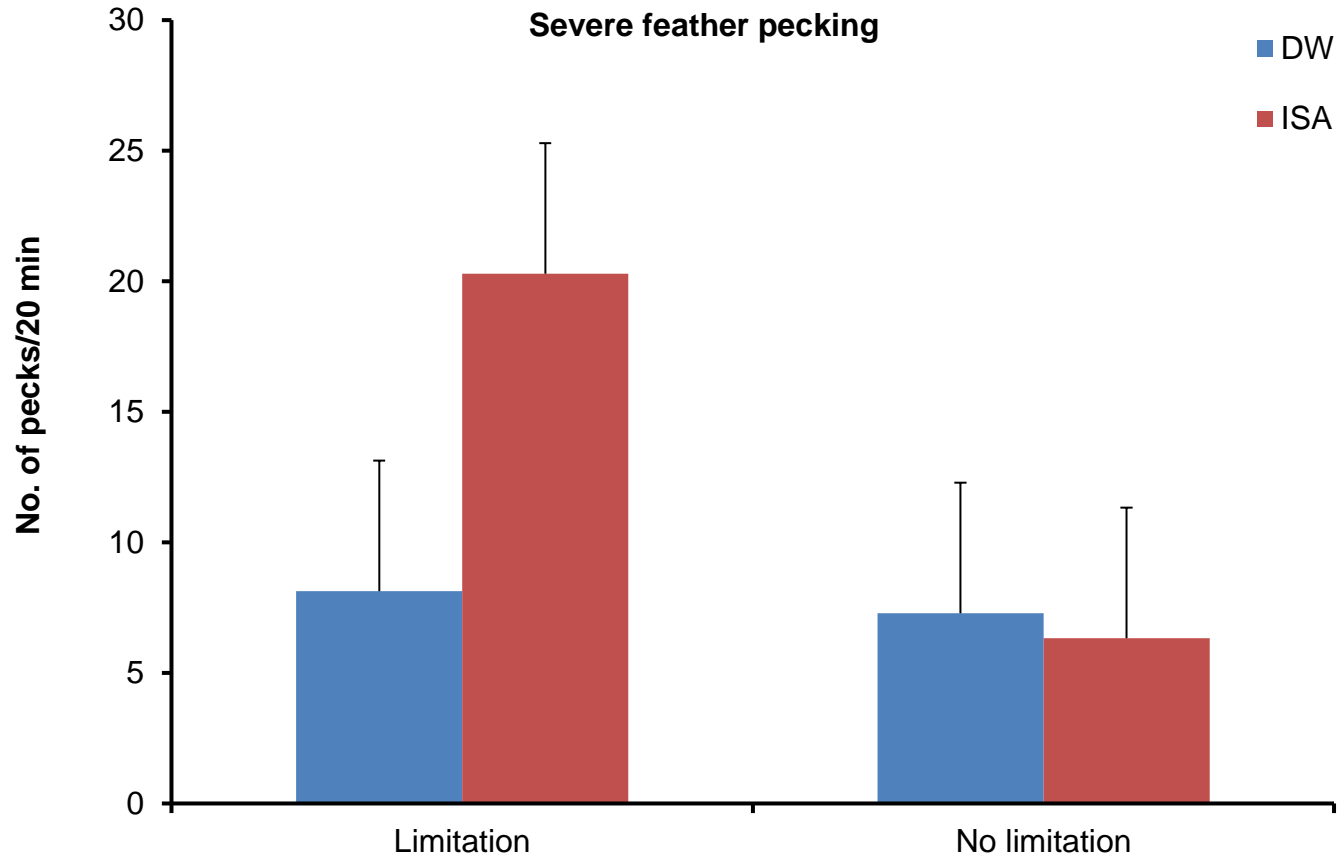
(De Haas et al., 2014) 18

## PPILOW Environmental stimulation: litter access



70% of the rearing flocks with damage at 5 weeks had problems with litter supply

(De Haas et al., 2014)



(De Haas et al., 2014)  
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- Rearing period
  - High level of severe FP at 5 wk of age
  - High fear of humans (both hybrids)
- Laying period
  - Floor housing rather than aviary
  - Large group size
  - High fear of humans
  - No modified management (26/35)



(De Haas et al., 2014)  
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- Differences between white and brown strains
  - White: more sensitive to stress, effect of parent stock
  - Brown: more sensitive to absence of litter, environmental stimulation
- Good human-animal relationship and a stimulating environment key to prevent feather pecking
  - Litter access
  - Environmental enrichment
- Simple fear test can provide an easy indicator of feather pecking risk



(De Haas et al., 2014)  
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## PPILOW Adult phase: on-farm observations



Collaboration with Dutch farms that work with small mobile houses for laying hens

During avian influenza: birds restricted to covered veranda

Four farms (two different types of mobile house):

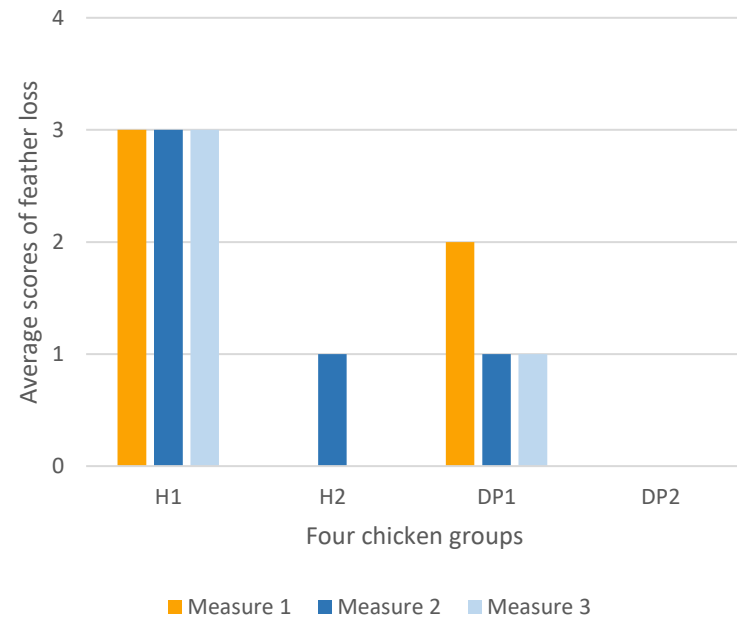
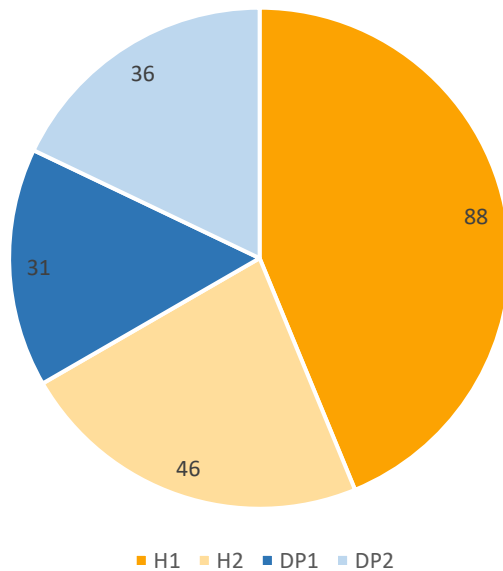
- Two farms with layer hybrid
- Two farms with dual-purpose hybrid
- Variation in quality of environmental enrichment in the covered veranda (only haybale or more variation)



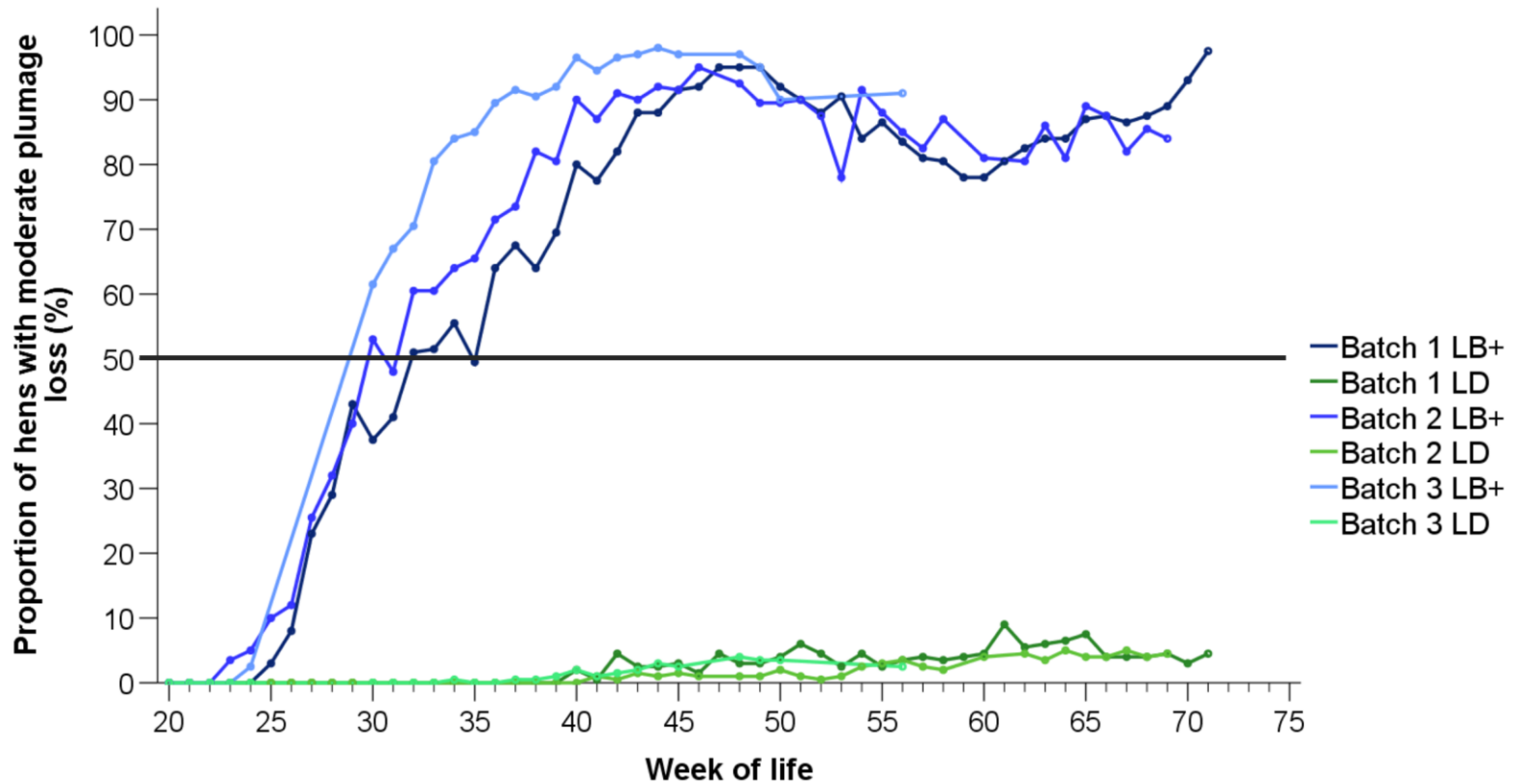


Four farms (two different types of mobile house):

- Most feather pecking and feather loss in one of the layer hybrid flocks (H1), which also had the poorer environment

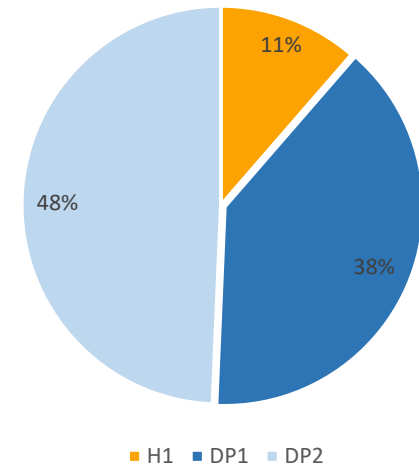
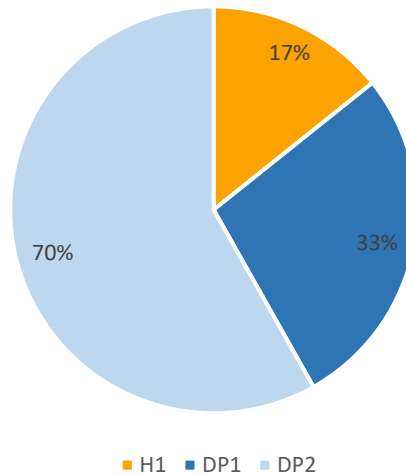
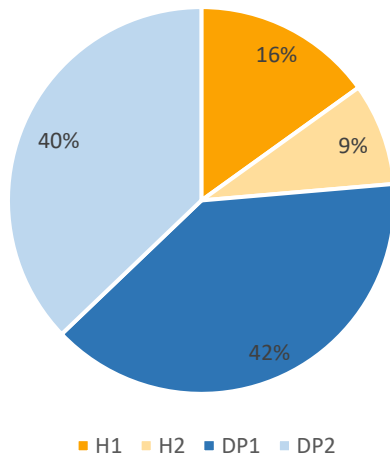


Confirmed in scientific studies (Giersberg et al, 2020):



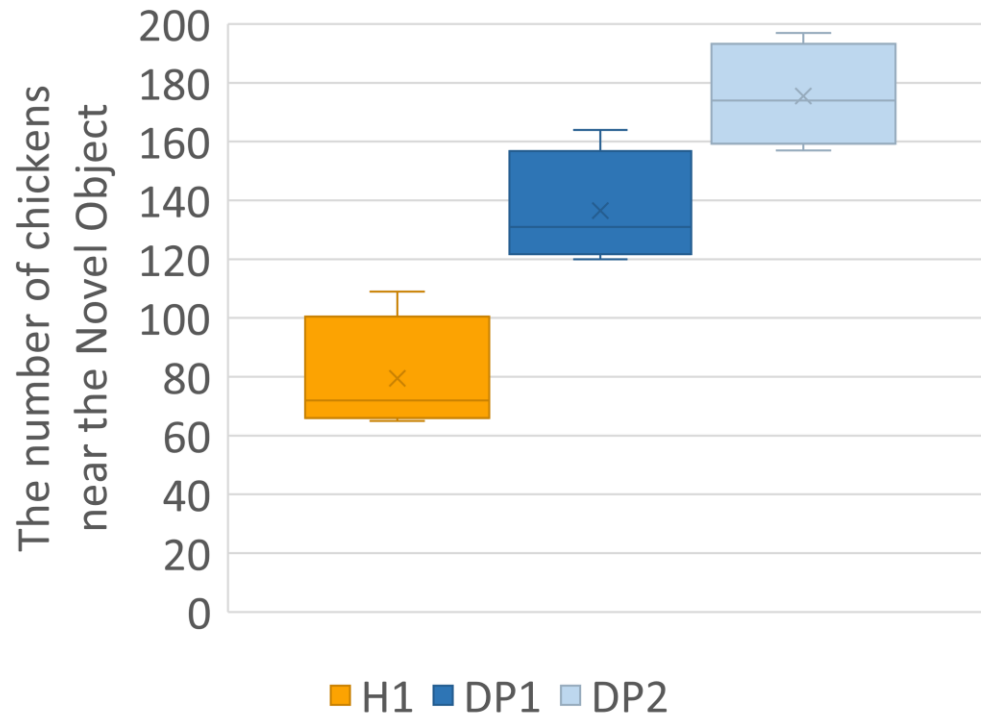
Four farms (two different types of mobile house):

- Dual-purpose flocks showed much more normal foraging behaviour (both during morning, afternoon and evening)



Four farms (two different types of mobile house):

- Dual-purpose flocks less fearful of a novel object
- Number of birds approaching



### Conclusions on-farm observations:

- During avian influenza outbreak, covered veranda is important for birds to show foraging (helps to prevent FP)
- Good quality environmental enrichment important: alfalfa bales, fresh greens, hay, straw, pecking blocks
- Dual-purpose birds seem less at risk to develop FP and show more normal foraging behaviour, less fearful – opportunity for small-scale producers?

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*Thank you for your attention*

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